

FLAT PANEL DISPLAY SYSTEM

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] This invention relates to systems for supporting one or more display panels. More particularly, the support system provides a means for supporting multiple displays such as flat screen liquid crystal display devices and enables their adjustment so as to maintain the screens in a common visual plane. The invention particularly relates to a modular hub and spoke system which provides easy alignment, greater range of adjustment, and which has, therefore, multiple uses.

Background and Prior Art

[0002] Computerized workstations can provide very large amounts of information provided that there is adequate display surface area. Banks of cathode ray tube monitors characterize a variety of work stations, including industrial control rooms, television broadcast studios and securities brokerages. The evolution of flat screen liquid crystal displays (LCD) has greatly reduced the size of monitors as well as decreased their weight and heat loading. The improved flexibility available for work station design requires methods for mounting multiple flat screens so that they are equally readable from the same viewing location (i.e. in the same focal plane) and adjustable for different users.

[0003] U.S. Patent publication 2002/0011544A1 discloses a quick-release system for replacing failed display monitors. U.S. Patent publication 2001/0045497A1 discloses an adjustable computer work station using multiple arms to raise and lower and adjust the angle of a display screen and a keyboard. U.S. Patent No. 5,842,672 discloses a multi-jointed and pivoted support system for a flat panel video display. U.S. Patent No. 5,820,287 discloses an articulated conduit joint involving two arms and a clutched joint to maintain adjusted location.

[0004] Systems for mounting multiple LCD panels heretofore have mounted panels on a separate support, have ganged panels on a common support bar or brace or have articulated each panel from a different point on a horizontal or vertical support. The result is that there is either limited range of movement for adjusting each panel or that each panel has a different range of motion.

Brief Description of the Invention

[0005] It is an object of this invention to provide a system for supporting displaying devices, especially flat screen LCD monitors which provides equivalent ranges of motion for each set of screens. It is a further objective of this invention to provide a system for supporting flat screen LCD monitors, which can be aligned to provide substantially equivalent focal points or focal planes. It is a further object of this invention to provide a modular mounting system which is adaptable to multiple screens using a single mounting system and a single mounting point on a desk or other support structure.

Brief Description of the Drawings

- [0006] Fig. 1 is a partial sectional view of a hub and a single spoke.
- [0007] Fig. 2 is an assembled duplex mounting system.
- [0008] Fig. 3 is an assembled quad assembly arrangement.
- [0009] Fig. 4 is a stacked quad assembly arrangement.
- [0010] Fig. 5 is a cut-away showing the brake assembly for locking the height setting.
- [0011] Fig. 6 is a section of Fig. 5 along line A-A.
- [0012] Fig. 7A and 7B are a plan and elevational view, respectively, of the brake cam of the locking device.
- [0013] Fig. 8 is a side view of the jack screw of the locking system.
- [0014] Figs. 9A and 9B are perspective views of the brake shoe of the locking device.
- [0015] Fig. 10 is a perspective view of the quick change mounting system.
- [0016] Fig. 11 is a perspective view of the monitor mounting bracket.
- [0017] Figs 12A and 12B are a perspective view of the quick change swivel plate.

Detailed Description of the Invention

[0018] The invention is a hub and spoke design for a mounting system to display one or more display devices, especially flat screen LCD monitors. More particularly, the invention enables the display of multiple monitors in a collage format for rapid viewing of multiple sets of information. The invention is characterized by being quickly adjustable but subsequently easily locked into

position. In addition, repairs may be made quickly by rapid change-out of screens. The invention will describe in terms of the illustrated embodiments shown in the drawings.

[0019] Fig. 1 shows a partial sectional view of the components of this invention. Hub 1, which for illustrative purposes is shown as a vertical tube, which is firmly mounted at one end (the base, not shown) to a desk, table, wall, furniture panel or accessory hanging system, supports a socket assembly arm 2. The socket or bore 5 receives a pivot post 7 which carries a swivel turret 9 with hinging means such as hinge pins 11 and 13. A radius arm 15 and a control arm 17 are carried on the hinge pins and connect to a second hinge bracket 19 with respective hinge pins 21 and 23 to form a parallelogram. A gas or coil steel spring (not shown because it is internal to arm 15) connects swivel turret to the arm 15 to stabilize the position of bracket 19. Bracket 19 carries a connector 25 which is illustrated as a post-type connector. Internal to 25 is a brake system shown in Fig. 5. A swivel turret 27 attaches to the post and has a fixed length arm 29 extending therefrom. The arm terminates in a swivel or socket 31 to which a short swivel arm 33 is rotatably attached. The swivel arm is parallel to said fixed length arm 29. The swivel arm terminates in a mounting bracket 35 which is adjustable about hinge pin 37. The screen is attached to bracket 35 using a system shown in Figs. 10-12.

[0020] Fig. 2 shows a duplex mounting arrangement wherein socket assembly arm 3 has been replaced with a duplex assembly 41 which carries two sockets and supports two arms, each articulated assembly being carried at the

same level on the hub 1.

[0021] Fig. 3 shows a quad socket assembly wherein a section 43 having four sockets is attached to the hub 1, the numbers for each element being those described *supra*.

[0022] Fig. 4 shows an assembly having two quad sockets mounted on the same hub structure. Again, the numbers for each element are those described *supra*.

[0023] Although the invention has been illustrated in terms of a tubular hub, square tubing or channel sections are equally usable. Likewise, a horizontal brace could be used for the hub and the sockets turned 90° compared to that illustrated in Figs. 1 through 4.

[0024] Critical to the operation of the system is the ability to locate each screen in a desired position and to hold the screen in that position. It is conventional to counterbalance flat screen monitors and other devices which are adjustable vertically using parallel arms hinged at their ends and to suspend them using coiled or gas springs. The force exerted by the spring induces a lifting force on the parallelogram arm which is changed by altering the angle of the spring. It therefore follows, detachment of the screen from the arm would cause a change in height setting. When multiple screens are placed in close proximity, as in trading and monitoring stations, and a quick change of screen is required, it is desirable the height setting of the screen mount remain constant. For this reason we have devised a method to lock each screen at the desired height setting.

[0025] Figure 5 shows the locking mechanism in a cut-away. Radius arm **15** and control arm **17** are the long parallel arms of the parallelogram. The bracket **19** and connector housing **25** have been partially cut away to reveal the location of hinge pins **21, 23**. A jackscrew **51** is retained by an unthreaded spacer sleeve **55**. At the top of the jackscrew is carried a cam **57** which is thread locked onto screw **51**. The lock of the cam presses against a brake shoe **59** forcing it into axle housing **60** molded into the end of arm **17**.

[0026] Fig. 6 shows the relationship of the components along line A-A.

[0027] Fig. 7A is a plan view of cam **57**. A circular base rests on the sleeve **51**. An eccentric lock **63** projects upwardly, as shown in side elevation Fig. 7B. The lock contacts the brake shoe **59**.

[0028] The jackscrew is shown in Fig. 8. Screw **51** has a head **53** which provides a point of engagement. The head may include a lever or thumb screw (not shown) but the preferred method employs a hex key wrench engaging in a hex head. The screw which ends in an unthreaded end **69**, carries threads over most of its length.

[0029] The brake shoe **59** is shown in top perspective in Fig. 9A and in bottom perspective in Fig. 9B. The brake shoe has a top surface **71**, a bottom surface **72**. On the side facing the hinge pin, a curved contact surface **73** is formed to engage the housing **60**. On the side facing the cam, a cam follower face engages the cam lobe **63**. Locating fork **75** rests on the top of the cam lobe and surrounds the unthreaded end of screw **51** to align the brake with the cam and hinge.

[0030] In operation, when the screen height has been set, the jackscrew is turned to urge the cam into the brake which presses against the housing **60** around hinge pin **21** to release the lock mechanism. To release, it is required only to back the jackscrew off less than half of a turn.

[0031] Rapid screen changes are available due to the quick change mounting system. The concept is shown in Fig. 10. Flat screen **81** has threaded receptacles **83** to which the trapezoidal surface plate **89** attaches with machine screws or equivalent fastening means.

[0032] As shown in Fig. 11, each side of the surface plate are channels **85, 87** disposed at an angle to the vertical such that the distance between the channels is greater at the base of the surface plate than at the top of the channels. At or near the top of each channel and disposed inwardly of the channel are protuberance **91, 93** from the surface plate. The protuberance needs only be a small fraction of the depth of the channels. Their function will be discussed below.

[0033] The swivel plate **95** is illustrated in Figs. 12A and 12B. Obverse face **97** has cantilevered locking tabs **101, 103** projecting vertically on each side. The plate is trapezoidally shaped to conform to the surface of plate **87** with the tabs **101, 103** sized to fit into channels **85, 87** respectively. The tabs are flexible over about one half of their upper portion. Countersunk area **105** allows a fastener to be used to secure the plate to bracket **35** without the fastener projecting past the surface of the face **97**. Fig. 12B shows the reverse face **99**. A pedestal area **107** conforms to the shape of countersunk area **105** and allows for a space between face **99** and bracket **35**.

[0034] Reverting to Fig. 10, it may be seen that the screen is lowered so that the swivel plate 95 slide into bracket 83. Tabs 101, 103 fit into channels 85, 87. When the tabs and channel fully conform, the ends of the tabs project slightly above the channels. When present, notches 109, 111 resist withdrawing the swivel plate from the mounting bracket. To effect removal, the tabs are drawn together, sliding across aforementioned protuberances 91, 93 so as to hold the ends of the tabs away from contact with the top of the channels. The screen can then be lifted off of the mount and a new screen installed in two motions. With the tabs held inwardly by the protuberances, both hands may be used to hold and manipulate the screen.

Industrial Applicability

[0035] The structures of this invention are useful in the petro-chemical industry for monitoring the condition of process equipment, in the distribution of products to determine, for example, availability status, in the transportation industry for viewing shipping information, departure schedules and service schedules, in the brokerage industry for displaying information relating to commodities and securities. The apparatus may also be used in the entertainment industry when a large picture is formed as a mosaic on a number of adjacent display screens.

[0036] Changes and departures in this invention may be made by those skilled in the art without departing from the spirit and scope thereof. Therefore the invention is not intended to be limited by the description and figures but are those as set forth in the following claims.